“Studies on Sustainable Agricultural Practices for Rajma Bean in vidarbha”

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A Synopsis on

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Research Topic : " Studies on Sustainable Agricultural Practices for Rajma Bean in vidarbha".

Short Resume

1.INTRODUCTION:

Sustainable farming is the necessity to the conservative approach to the nature. Organic farming is lauded for its ability to enhance soil carbon sequestration, improve biodiversity, and reduce nitrogen leaching compared to conventional agriculture. While yield gaps may exist relative to intensive farming systems, organic farming's environmental and social benefits underscore its role in sustainable agriculture and climate change mitigation. This conceptual framework of organic farming combines ecological science and traditional farming knowledge to develop resilient agricultural systems adaptable to varying environments.

Organic farming prioritizes soil as a living system, enhancing fertility through crop rotations, organic amendments (e.g., compost and manure), and cover crops, which increase organic matter and microbial activity By fostering biodiversity, organic systems aim to create ecological equilibrium. This includes encouraging natural predators to manage pests, integrating multiple crop species, and conserving habitats.

Nutrient recycling is a cornerstone of organic farming. Farm residues, animal manure, and leguminous crops are integral for nutrient replenishment, reducing reliance on synthetic fertilizers. Organic farming emphasizes resource conservation, focusing on renewable resources, water conservation, and reducing environmental impact through methods like reduced tillage and efficient energy uses. The avoidance of chemical pesticides and herbicides minimizes pollution and reduces the risk of ecological and human health hazards.

Over 3.7 million organic farmers worldwide (as of 2023).Most organic farmers are located in India, Uganda, and Ethiopia, with India leading the count. Approximately 76.4 million hectares of land are organically farmed globally. Countries by organic farming area Australia

35.7 million hectares (47% of the global organic area). Argentina 4.1 million hectares. Spain 2.4 million hectares.

The global organic food market was valued at $227 billion in 2022, with projections to grow significantly. India has the largest number of organic farmers globally, approximately 1.6million registered farmers.2.78 million hectares (including certified and in-conversion land).This represents 2% of India's total agricultural area. Madhya Pradesh: Largest organic farming state with 40% of the area. Other leading states: Maharashtra, Rajasthan, Sikkim, and Karnataka. Sikkim: Became the world's first 100% organic state in 2016.

India exported $1.04 billion worth of organic products in 2022-23. Key exports include tea, coffee, spices, oilseeds, and fruits. Adopt organic techniques like composting, crop rotation, and biological pest control. Livestock raised organically with natural feed and no synthetic hormones. Sikkim's 100% organic transition is an example where an entire region adopted organic practices. Promotes community-driven sustainable agriculture. Government policies and programs support organic farming at the national level. In India, initiatives like Paramparagat Krishi Vikas Yojana (PKVY) promote organic farming. International standards and certifications (e.g., EU Organic, USDA Organic) regulate organic farming globally. Growth driven by global consumer demand for organic product.

Pesticides while essential in modern agriculture for controlling pests and enhancing crop yields, have significant societal implications encompassing health, environmental, and economic dimensions. Their widespread use necessitates a careful evaluation of both their benefits and drawbacks. Exposure to pesticides can cause immediate health issues such as skin irritation, respiratory distress, and poisoning, particularly in agricultural workers and rural communities.

Chronic Effects Long-term exposure is associated with serious health risks, including cancers, neurotoxicity, endocrine disruption, and developmental issues in children. Persistent organic pollutants (POPs) found in certain pesticides are particularly harmful due to their bio accumulative properties. Residues in Food Pesticide residues in food pose risks to consumers, even at low levels, especially over prolonged periods. Vulnerable populations, such as children and pregnant women, are at greater risk due to their physiology.

Biodiversity Loss Pesticides have been linked to declines in pollinator populations, such as bees and butterflies, which are vital for ecosystems and agriculture. They also harm aquatic organisms through runoff and soil organisms essential for soil health. Water and Soil Contamination: Pesticide leaching into water bodies contaminates drinking water supplies, posing risks to both human and aquatic life. Persistent chemicals can degrade soil quality over time. Climate Impacts Manufacturing and application processes for pesticides contribute to greenhouse gas emissions, indirectly affecting climate change. Healthcare Costs Treating pesticide-related health issues imposes a significant financial burden on individuals and public health systems. Impact on Farmers Overreliance on pesticides leads to pest resistance, requiring higher doses or more expensive alternatives, escalating production costs.

Global Trade Contamination from pesticides can lead to trade barriers when agricultural exports fail to meet stringent residue limits in importing countries. Inequitable Exposure: Marginalized communities, particularly in developing countries, face disproportionate exposure due to limited regulations and personal protective equipment. Intergenerational Risks: Long-lasting environmental contamination from pesticides can affect future generations through degraded ecosystems and persistent health risks .

Rajma, commonly known as kidney beans (*Phaseolus vulgaris*), is a leguminous crop widely grown in India and other parts of the world for its edible seeds. It is an important crop both as a source of nutrition and as part of crop rotation systems, enriching the soil with nitrogen due to its nitrogen-fixing properties.
Botanical Name: *Phaseolus vulgaris* L.
Family:Fabaceae

Rajma is an excellent source of protein, fiber, vitamins, and minerals like iron, potassium, and folate. It is particularly valued in vegetarian diets as a source of plant-based protein. It is also low in fat and contains complex carbohydrates, making it a great food for managing blood sugar levels. Rajma thrives in warm climates and is generally grown during the kharif season (monsoon season) in India. The crop prefers well-drained, loamy soils with a pH range of 6 to 7. It is moderately drought-tolerant but benefits from consistent rainfall or irrigation during its growth period. Rajma is typically grown as an annual crop. The growing period is around 90 to

120 days, depending on the variety and climatic conditions. The crop requires moderate temperatures ranging from 20°C to 30°C and good sunlight for optimal growth.

There are various types of Rajma grown in India, with some of the most popular varieties being Kashmiri Rajma, Chitra, and Panchali. Average yield ranges from 800 to 1,200 kg per hectare under optimal conditions, although this can vary with soil quality, climate, and management practices. Rajma is susceptible to pests such as aphids, whiteflies, and root rot diseases, which can significantly affect yields. Proper pest management strategies, including organic treatments, crop rotation, and use of disease-resistant varieties, can help mitigate these issues.

Rajma is a staple food in many parts of India, especially in states like Himachal Pradesh, Jammu & Kashmir, Punjab, and Uttar Pradesh. It is also a key ingredient in various traditional dishes such as Rajma Chawal (kidney beans served with rice), making it culturally significant. After harvesting, Rajma seeds are typically dried to preserve them for storage and market sale. They have a long shelf life when stored in cool, dry conditions.

Rajma, like other legumes, plays a vital role in sustainable farming systems by improving soil health. It enhances soil nitrogen content through its symbiotic relationship with rhizobia bacteria in its root nodules, making it an essential crop for crop rotation and reducing the need for synthetic nitrogen fertilizers.

IMPORTANCE OF STUDY:-

1. Enhancing Soil Health and Fertility :-A primary objective of organic farming is to improve soil health through natural methods. Practices such as crop rotation, composting, and the use of organic manure enrich the soil with organic matter, promoting beneficial microbial activity. This increases soil structure, water retention, and nutrient availability, which are vital for long-term agricultural productivity.

2. Promoting Biodiversity :-Organic farming aims to maintain a diverse ecosystem. By avoiding synthetic pesticides and herbicides, it fosters a wide range of plant and animal species, including beneficial insects, birds, and soil organisms. This biodiversity is essential for natural pest control, pollination, and the overall health of the environment .

3. Reducing Environmental Impact :-One of the core goals of organic farming is to minimize environmental pollution. This includes reducing chemical runoff, avoiding soil erosion, and promoting water conservation. By eliminating the use of synthetic chemicals, organic farming contributes to cleaner water and air, and helps mitigate the negative impacts of conventional agriculture on the planet's ecosystems .

4. Promoting Human and Animal Health :-Organic farming practices prioritize the health of both consumers and farm workers. By avoiding synthetic chemicals and genetically modified organisms (GMOs), organic products are considered safer, with reduced pesticide residues. Additionally, the humane treatment of livestock is emphasized, ensuring animals are raised in conditions that support their natural behaviors and well-being .

5. Economic Viability and Social Responsibility :-Organic farming also aims to create a more resilient agricultural economy. It encourages fair trade, local food systems, and economic independence for farmers. By reducing dependency on external inputs like synthetic fertilizers and pesticides, organic farming fosters self-sufficiency and can improve the financial viability of farming in the long run . It also promotes social responsibility by advocating for better working conditions and more equitable food systems.

6. Climate Change Mitigation :- Through practices like reduced tillage, agroforestry, and carbon sequestration, organic farming contributes to climate change mitigation. Organic farms tend to have higher levels of organic matter in the soil, which can store carbon and reduce greenhouse gas emissions. Organic farming’s emphasis on minimizing synthetic inputs further reduces its carbon footprint .These objectives collectively contribute to a sustainable and resilient agricultural system that supports ecological balance, promotes human well-being, and fosters economic stability in the long term.

OBJECTIVE OF PROPOSED RESEARCH:-

1. To investigate the impact of Beejamrut, Jivamrut, Dashparniark, and Saptdhanya Ark on the yield and quality of Rajma beans.

2. To determine the optimal concentrations of Beejamrut, Jivamrut, Dashparniark, and Saptdhanya Ark for enhancing the yield and quality of Rajma beans.

3. To identify the most suitable timing for applying Beejamrut, Jivamrut, Dashparniark, and Saptdhanya Ark for optimal growth of Rajma beans.

4. To analyze the economic viability of different treatment applications for Rajma bean cultivation.

REVIEW OF LITERATURE:-

Palekar (2006) defined jivamrut as a fermented liquid product and he added 200 litres quantities of jivamrut prepared by mixing cow dung (10 kg), cow urine (10 litres), jaggary (2 kg), legume flour (2 kg), water (200 litres) and a handful of soil brought from the bunds of the cultivated lands. Jivamrut also contains enormous amount of beneficial microbial load which on application enhances microbial activity in soil and ultimately ensuring the availability and uptake of nutrients by the crops.

Jivamrut is important to provide a congenial environment for growth of beneficial microorganisms that help in making the essential nutrients available for plant growth viz., nitrogen, phosphorus and potassium. Application of jivamrut to the soil improves the soil fertility considerably by ensuring the availability and uptake of nutrients by the crops and also encourages microbial activities in the soil (Palekar, 2006).

Pathak and Ram (2007) found that the jivamrut contains Azospirillum (2×10^6cfu), PSM (2×10^6cfu), Pseudomonas (2×10^2cfu), Trichoderma (2×10^6cfu), yeast and moulds (2×10^7cfu) per ml of sample, when the samples were analyzed after 5 days of incubation.

Kesarwani (2007) conducted a field experiment at Banglore, Karnataka, found that application of organic mixture according to SubhashPalekar's method (beejamrut (seed treatment) + jivamrut (soil application) + straw mulch) to sweet sorghum improved the ear head weight, 100 grain weight and total biomass production which were on at par with 100 % RDF (100:75:40 kg N: P2O5: K2O/ha).

Devakumar et al. (2008) observed the maximum microbial population between 9 th and 12th day of preparation of jivamrut. This enhances the decomposition process in the soil resulting in relatively quick release of nutrients from compost than without application of jivamrut.

Shwetha and Babalad (2008) conducted an experiment to know the effect of nutrient management through organics in soybean-wheat cropping system at Main Agricultural Research Station, Dharwad, on a medium deep black clay loam soil. They reported that there was significantly higher leaf area index, plant height, number of branches, dry matter accumulation, seed yield and yield parameters in soybean like the number of pods per plant with the application

of organic manures in combination with liquid organic manures viz. beejamrut, jivamrut and panchagavya as compared with the application of organics alone.

Chandrakala (2008) conducted an experiment at Dharwad, Karnataka, observed that liquid manure treatment beejamrut + jivamrut + panchagavya and Review of Literature 8 panchagavyaalone recorded significantly highest dry chilli yield (8.52 and 8.01 q/ha, respectively) over control (6.40 q/ha) in addition to significantly higher plant height.

Ramprasad et al. (2009) reported that jivamrut has to be applied once in 15 days @ 50-200 litres per acre during vegetative, flowering and grain filling stages and can also be applied alone or along with irrigation water.

Ravi kumar et al. (2011) reported that the addition of jaggery and pulse flour with continuous stirring while preparing jivamrut will help in faster multiplication of nitrogen fixing bacteria.

Shreenivasa et al. (2011) reported that the presence of beneficial microorganisms in jivamrut might be due to its constituents such as cow dung, cow urine, legume flour and jaggery which contain both macro and micro nutrients besides vitamins, essential amino acids, growth promoting substances like Indole Acetic Acid (IAA), Gibberlic Acid (GA) and beneficial microorganisms. Similar results were reported by Palekar (2006); Neelima and Shreenivasa (2011).

Devakumar et al. (2016) conducted an experiment at Banglore, Karnataka, reported that application of N equivalent compost with beejamrut and jivamrut resulted in increasing the yield of organic fieldbean compared to individual application of different N equivalent compost and beejamrut.

Jagdale (2018) conducted an experiment at Parbhani, Maharashtra, found significantly higher available N, P, K, Fe, Mn and Cu in treatment where RDF+ beejamrut + jivamrut + panchagavya was applied to soybean.

Parikh (2021) conducted an experiment onResponse of sesame to jivamrut resulted in increasing the yield ,height ,numper of capsulr per plant increasing. Application of jivamrut, levels of jivamrut and time of application of jivamrut failed to exert any significant influence on available N, P2O5, K2O, pH and EC of soil after harvest of crop.

SumanthPrabhu (2020) conducted a field experiment at Jobner, observed significant increase in plant height, number of branches per plant, number of capsules per plant, seeds per capsule, test weight and seed yield of sesame with application of jivamrut @ 5% compare to no jivamrut.

MATERIAL AND METHODS :-

- ## FYM method :-

The cow dung composting method involves mixing cow dung with organic materials, piling it for decomposition, turning it for aeration, maintaining moisture, and allowing it to mature into nutrient-rich compost for sustainable farming.

- ## Bijamrut application method :-

Bijamrut is an organic seed treatment used in natural farming to protect seeds from pests and diseases while enhancing germination. It is made by mixing cow dung, cow urine, lime, and water with a small amount of soil. Seeds are soaked or coated with this mixture before sowing to promote healthy growth.

- ## Jivamrut application method :-

The **Jivamrut method** is an organic liquid bio-fertilizer used in natural farming. It is prepared by fermenting a mixture of cow dung, cow urine, jaggery, pulse flour, soil, and water for 3-5 days. This microbial-rich solution enhances soil fertility and promotes plant growth when applied to crops or soil.

- ## Dashparni ark application method :-

Dashparni Ark is an organic pesticide prepared in natural farming to control pests and diseases. It is made by fermenting a mixture of cow urine, cow dung, neem leaves, and other medicinal plants (like tulsi, dhatura, and garlic) for 15-20 days. The liquid is then diluted with water and sprayed on crops. It is eco-friendly and effective against a wide range of pests while promoting plant health.

- ## Saptadhanya ark application method:-

Saptadhanya Ark is an organic growth enhancer and pest repellent prepared by fermenting a mix of seven grains (e.g., wheat, rice, maize, barley, chickpea, sorghum, and millet) with cow urine and water for 7-15 days. The fermented liquid is filtered and diluted before use to boost crop growth and protect against pests in sustainable farming practices.

Observation:-

The vegetative and reproductive growth of plant will be timely recorded.

statistically analysis:- Data will be analysed statistically.

Economic :- The cost benefit ratio will be calculated according to the expenditure in the plot .

Sr.no	Methods	Concentration	Time of application
1.	FYM method	10 t/ha	pre sowing
2.	Bijamrut method	500 lit/ha,750lit/ha,1000 lit/ha	15 days and 30 days
3.	Jivamrut method	500 lit/ha,750lit/ha,1000 lit/ha	15 days and 30 days
4.	Dashparni ark method	500 lit/ha,750lit/ha,1000 lit/ha	15 days and 30 days
5.	Saptadhanya ark method	500lit/ha,750lit/ha,1000 lit/ha	15 days and 30 days

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